Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 02, Issue: 03 (MAY-JUNE, 2022)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

National Innovations in Climate Resilient Agriculture

(*Pushkar Dev and Dilip Singh)
Krishi Vigyan Kendra, Navgaon, Alwar-1
* pushkardevgurjar@gmail.com

National Innovations in Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. The project consists of four components viz. Strategic Research, Technology Demonstration, Capacity Building and Sponsored/Competitive Grants.

Background

Climate change has become an important area of concern for India to ensure food and nutritional security for growing population. The impacts of climate change are global, but countries like India are more vulnerable in view of the high population depending on agriculture. In India, significant negative impacts have been implied with medium-term (2010-2039) climate change, predicted to reduce yields by 4.5 to 9 percent, depending on the magnitude and distribution of warming. Since agriculture makes up roughly 16 percent of India's GDP, a 4.5 to 9% negative impact on production implies a cost of climate change to be roughly up to 1.5 percent of GDP per year. The Government of India has accorded high priority on research and development to cope with climate change in agriculture sector. The Prime Minister's National Action Plan on climate change has identified Agriculture as one of the eight national missions.

Objectives

With this background, the ICAR has launched a major Project entitled, **National Initiative on Climate Resilient Agriculture (NICRA)** during 2010-11 with an outlay of Rs.350 crores for the XI Plan with the following objectives.

- To enhance the resilience of Indian agriculture covering crops, livestock and fisheries to climatic variability and climate change through development and application of improved production and risk management technologies
- To demonstrate site specific technology packages on farmers' fields for adapting to current climate risks
- To enhance the capacity building of scientists and other stakeholders in climate resilient agricultural research and its application.

Project Components

Both short term and long terms outputs are expected from the project in terms of new and improved varieties of crops, livestock breeds, management practices that help in adaptation and mitigation and inputs for policy making to mainstream climate resilient agriculture in the developmental planning. The overall expected outcome is enhanced resilience of agricultural

production to climate variability in vulnerable regions. The project is comprised of four components.

1) Strategic research on adaptation and mitigation
2) Technology demonstration on farmers' fields to cope with current climate variability
3) Sponsored and competitive research grants to fill critical research gaps
4) Capacity building of different stake holders

Strategic Research

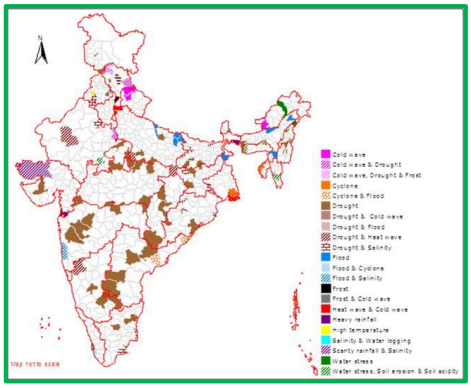
The strategic research has been planned at leading research institutes of ICAR in a network mode covering crops, horticulture, livestock, natural resource management and fisheries sectors. To begin with, the project is focusing on crops like wheat, rice, maize, pigeonpea, groundnut, tomato, mango and banana; cattle, buffalo and small ruminants among livestock and both marine and freshwater fish species of economic importance. The major research themes are:

- Vulnerability assessment of major production zones
- Linking weather based agro-advisories to contingency planning
- Assessing the impacts and evolving varieties tolerant to key climatic stresses (drought, heat, frost, flooding, etc.) in major food and horticulture crops
- Continuous monitoring of greenhouse gases in open field conditions in major production systems
- Evolving adaptation and mitigation strategies through enhancing water and nutrient use efficiency and conservation agriculture
- Studying changes in pest dynamics, pest/pathogen-crop relationships and emergence of new pests and pathogens under changing climate
- Adaptation strategies in livestock through nutritional and environmental manipulations
- Harnessing the beneficial effects of temperature in inland and marine fisheries through better understanding of the spawning behaviour.

The research was initiated during 2011-12 in all the above themes. The major emphasis during the year was on building state of art research infrastructure like high throughput phenotyping platforms, free air temperature elevation systems in open fields, environmental growth chambers with CO2and temperature controls and special caloric metric system to study livestock response to heat stress. These are some of the unique facilities being set up for the first time in Asia. In all the target crops like rice, wheat, maize, pigeonpea, tomato and mango, core sets of genetic resources were assembled and field phenotyped at different institutions with a view to identify sources of tolerance to climatic stresses and related genes and traits. For the first time, all the germplasm of wheat with NBPGR has been multiplied for field phenotyping and currently under evaluation. Country wide studies have been initiated to understand the

impact of temperature on flowering behaviour in mango. A nationwide pest surveillance and monitoring system has been put in place for all the target crops for major pests and diseases wherein real time incidence is being monitored along with weather parameters to build pest warning models. Methods for measurement of green house gas emissions in the marine ecosystem have been standardized. Carbon sequestration potential through agro forestry systems across the country is being quantified. Monitoring of experiments on conservation agriculture in different production systems is initiated to assess the adaptation and mitigation potential of CA practices. The vulnerability of all the rural districts in the country (about 540) is being quantified in terms of exposure, sensitivity and adaptive capacity in order to prepare a vulnerability atlas.

Technology Demonstration



The technology demonstration component deals with demonstrating proven technologies for adaptation of crop and livestock production systems to climate variability.

This component is implemented in selected vulnerable districts of the country through location specific interventions by Krishi Vigyan Kendras in a participatory mode. The project is implemented in 100 districts (see map) involving over one lakh farm families across the country. These districts are selected based on the following criteria besides the strength of the KVKs:

- Drought proneness based on 30 years rainfall data (Source : IMD)
- Cyclone proneness based on frequency as recorded by IMD/State Disaster Management agencies.
- Flood proneness based on IMD data and NDMA maps.
- Vulnerability to heat wave and cold wave based on IMD grid data on temperatures.
- Actual incidence of floods and droughts as recorded by AICRPAM centers

The interventions in the village panchayats are finalized following a participatory approach through the Village Climate Risk Management Committee (VCRMC), after the PRA to assess the climate related problems in the village and baseline survey. The program was launched formally in all the villages by involving the state line department functionaries and leaders of the panchayats to ensure local ownership of the project from the beginning and convergence of related schemes currently in operation in the panchayat. In each village, the interventions are made in the following four modules:

Module I: Natural resources: This module consists of interventions related to in-situ moisture conservation, water harvesting, supplemental irrigation, improved drainage in flood prone areas, conservation tillage where appropriate, artificial ground water recharge and water saving irrigation methods.

Module II: Crop Production: This module consists of introducing drought/temperature/flood tolerant varieties, advancement of planting dates of rabi crops in areas with terminal heat stress, water saving paddy cultivation methods (SRI, aerobic, direct seeding), frost management in horticulture through trash burning, community nurseries for delayed monsoon, custom hiring centres for timely planting, location specific intercropping systems with high sustainable yield index.

Module III: Livestock and Fisheries: Use of community lands for fodder production during droughts/floods, improved fodder/feed storage methods, preventive vaccination, improved shelters for reducing heat stress in livestock , management of fish ponds/tanks during water scarcity and excess water, etc.

Module IV: Institutional Interventions: This module consist of institutional interventions either by strengthening the existing ones or initiating new ones relating to seed bank, fodder bank, commodity groups, custom hiring centre, collective marketing, introduction of weather index based insurance and climate literacy through a village level weather station.

The unique features of this project are setting up of custom hiring centers in all the 100 villages and formation of Village Climate Risk Management Committees. For each intervention, it is planned to work out the carbon, water and energy foot prints.